

What is claimed is:

1. An isolated protein comprising an amino acid sequence as set forth in SEQ ID NO: 2, 4, 6 or 8.

5 2. An isolated protein consisting of an amino acid sequence as set forth in SEQ ID NO: 2, 4, 6 or 8.

3. An isolated protein, wherein the protein comprises a DNA repair activity and is encoded by a nucleic acid that hybridizes under stringent conditions with a nucleic acid
10 comprising all or a part of the nucleotide sequence as set forth in SEQ ID NO: 1, 3, 5 or 7.

4. An isolated nucleic acid encoding a protein comprising an amino acid sequence as set forth in SEQ ID NO: 2, 4, 6 or 8.

15 5. An isolated nucleic acid comprising: (a) a DNA consisting of the nucleotide sequence as set forth in SEQ ID NO: 1, 3, 5 or 7; or, a complementary strand to (a).

6. An isolated nucleic acid, wherein the nucleic acid encodes a polypeptide comprising a DNA repair activity and hybridizes under stringent conditions with a nucleic
20 acid comprising the nucleotide sequence as set forth in SEQ ID NO: 1, 3, 5 or 7, or, with a complementary strand thereto.

7. An isolated nucleic acid, wherein the nucleic acid encodes a polypeptide comprising a DNA repair activity and hybridizes under stringent conditions with a probe
25 prepared from a nucleic acid comprising all or a part of a nucleotide sequence as set forth in SEQ ID NO: 1, 3, 5 or 7, or from a complementary strand thereto.

8. The isolated nucleic acid, wherein the stringent conditions comprise a wash step comprising a wash in 0.2X SSC at a temperature of about 65°C for about 15 minutes.

9. A recombinant vector comprising a nucleic acid as set forth in claims 4, 5, 6 or 7.

10. A recombinant vector comprising a nucleic acid encoding a polypeptide as set forth in claims 1, 2 or 3.

11. A transformed cell comprising a recombinant vector as set forth in claim 9.

12. A transformed cell comprising the recombinant vector as set forth in claim 10.

13. A method of producing a DNA repair enzyme, comprising
(a) culturing a transformed cell according to claim 11 or claim 12, and
(b) recovering the DNA repair enzyme from the resultant culture, thereby producing a DNA repair enzyme.

14. A method of producing a DNA repair enzyme, comprising
(a) culturing a transformed cell according to claim 11 or claim 12, and
(b) recovering the DNA repair enzyme from the resultant culture, thereby producing a DNA repair enzyme.

15. A method of repairing a DNA for sequence errors or base mismatch errors, comprising carrying out a DNA synthesis reaction in the presence of a polypeptide as set forth in claims 1, 2 or 3.

16. A method of preventing erroneous synthesis of DNA sequences, comprising carrying out a DNA synthesis reaction in the presence of a polypeptide as set forth in claims 1, 2 or 3.

17. A DNA repair gene-disrupted cell obtained by transferring into a host cell a nucleic acid as set forth in claims 4, 5, 6 or 7.

18. The DNA repair gene-disrupted cell of claim 17, wherein a modification gene has been incorporated into the nucleic acid.

19. The DNA repair gene-disrupted cell of claim 18, wherein the modification gene comprises a marker gene.

20. The DNA repair gene-disrupted cell of claim 17, wherein the host is a bacterium.

21. The DNA repair gene-disrupted cell of claim 20, wherein the bacterium is a thermophilic bacterium.

22. The DNA repair gene-disrupted cell of claim 21, wherein the thermophilic bacterium is a bacterium of the genus *Thermus*.

23. The DNA repair gene-disrupted cell of claim 22, wherein the thermophilic bacterium is a *Thermus thermophilus*.

24. An array comprising a nucleic acid as set forth in SEQ ID NO: 1, 3, 5 or 7.

25. An array comprising a nucleic acid as set forth in claims 4, 5, 6 or 7.

26. A method of screening a composition for its ability to specifically bind to a DNA repair enzyme comprising:

(a) contacting the a DNA repair enzyme with the composition, wherein the DNA repair enzyme is a polypeptide encoded by a nucleic acid sequence as set forth in claims 4, 5, 6 or 7; and,

(b) determining if the composition specifically binds to the DNA repair enzyme.

27. A method for inhibiting the expression of a DNA repair enzyme encoding nucleic acid in a cell, the method comprising the following steps:

(a) providing a nucleic acid operably linked to a promoter that expresses an inhibitory sequence, wherein the inhibitory sequence comprises all or part of a nucleic acid sequence as set forth in claims 4, 5, 6 or 7 and is expressed in a form sufficient to inhibit expression of a DNA repair enzyme message; and,

(b) expressing the inhibitory nucleic acid in an amount sufficient to inhibit the expression of the DNA repair enzyme encoding nucleic acid in the cell.

28. The method of claim 27, wherein the inhibitory sequence comprises an antisense sequence.

29. The method of claim 27, wherein the inhibitory sequence comprises a ribozyme sequence.

30. A method of expressing a heterologous nucleic acid sequence in a cell comprising:

a) transforming the cell with a heterologous nucleic acid operably linked to a promoter, wherein the heterologous nucleic acid comprises a nucleic acid sequence as set forth in claims 4, 5, 6 or 7; and,

b) growing the cell under conditions where the heterologous nucleic acid sequence is expressed in the cell.

31. A method for detecting a nucleic acid in a nucleic acid -containing biological sample, the method comprising the following steps:

(a) contacting the sample with a nucleic acid probe comprising a nucleic acid sequence as set forth in claims 4, 5, 6 or 7;

(b) hybridizing the nucleic acid probe to the nucleic acid in the sample; and,

(c) detecting hybridization of the nucleic acids.

32. An fusion protein comprising a first amino acid sequence as set forth in SEQ ID NO: 2, 4, 6 or 8, or a subsequence thereof, and a second heterologous sequence.

5 33. An isolated antibody specifically reactive with a polypeptide as set forth in claim 1, claim 2 or claim 3 or a polypeptide encoded by a nucleic acid as set forth in claim 4, claim 5, claim 6, or claim 7.

34. The antibody of claim 33, wherein the antibody is a monoclonal antibody.

10 35. A hybridoma cell comprising the monoclonal antibody of claim 34.